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## THE GEOGRAPHIC ORIGIN OF CRATAEGUS VIRIDIS L.

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THE authors of the manuals and floras of the Northeastern States, and of works on the trees of North America, as well as the writers in general on *Crataegus* give as the range of *Crataegus viridis* L. some such expression as, "from Maryland and Virginia to Florida, west to Louisiana, Arkansas and Texas, and up the Mississippi Valley to Saint Louis, Missouri."

It would seem that this claim is ably supported by the presence of an association of over two hundred characteristically southern plants in southeastern Missouri, conspicuous amongst which are *Taxodium distichum*, *Acer Drummondii*, *A. Carolinianum*, *Aesculus austrina*, *Leitneria Floridana*, *Arundinaria tecta*, *Hicoria aquatica*, *Styrax Americana*, *Nyssa aquatica*, *Catalpa speciosa*, *Planera aquatica*, *Ilex opaca*, *Fraxinus profunda*, *Bradleya macrostachys*, *Populus heterophylla*, *Itea Virginica*, *Quercus lyrata*, *Q. Phellos*, *Q. Michauxii*, *Phoradendron flavescens*, *Brunnichia cirrhosa*, *Euonymus Americanus*, *Gleditsia aquatica*, *Crataegus Marshallii*, *Aralia spinosa*, *Berchemia scandens* and *Liquidambar Styraciflua*, species which have come up the old valley of an ancient sea. That they have come up is attested by individuals occurring all the way down this valley to the center of greatest distribution, but that the presence of these two hundred and odd southern species in southeastern Missouri proves that *Crataegus viridis* L., and its congeners, came up the Mississippi Valley, is hereafter to be greatly doubted.

Much has been written of plant distribution, and I am fully aware of the importance of such an association as that indicated in the

preceding paragraph, and reasoning from our knowledge of the inland extension along the Mississippi Valley of so many characteristically southern species, it would on first thought appear that *Crataegus viridis* L. has merely followed in the wake of its southern companions, with which it is so often found in the Southern States.

That any species should ascend the former bed of this ancient inland sea for so great a distance as to Saint Louis, Missouri, without leaving along the path of its invasion a certain number of scattered individuals is scarcely believable; and I will proceed to show the futility of longer believing that *Crataegus viridis* L., and its many forms, came up the Mississippi Valley to Saint Louis, Missouri, and to demonstrate that any species is much more likely to skip large sections of country in going down such a valley.

Having observed and studied *Crataegus viridis* in northern Florida, southern Alabama, southern Mississippi, Louisiana, southern Arkansas and southeastern Texas during the past fifteen years, I have noted that the species inhabits regions of relatively low altitude, sometimes straying to comparatively high ground near by. I have visited many places in northern and northeastern Arkansas, and have collected at Hoxie, Jonesboro, Marked Tree and Paragould in that state, and as far as I have observed the tree, *Crataegus viridis* L. is rare there. In adjacent Missouri I have noted as many as fifteen of twenty trees of this species in Dunklin County, a half dozen or so in Butler County, and the species is quite unknown in Scott, Stoddard, Wayne, Ripley, Carter, Oregon, Shannon, Howell, Texas, Wright, Webster, Greene, Christian, Taney, Stone, Barry and McDonald Counties, a strip reaching from the Mississippi River to the western boundary of the State, where I have done much collecting.

Some eight or ten years ago I found at Webb City and at Joplin, Missouri, a great colony of *Crataegus viridis* or forms of that species, and as this locality is mostly over one thousand feet in altitude, it seemed to me that these forms could not be the true *Crataegus viridis* of Linnaeus, which is a coastal species and inhabits low altitudes. Several years investigations have shown that this great colony of *Virides*<sup>1</sup> extends west into Kansas, southwest into and across Oklahoma, and as far as Llano, Dallas, and Fort Worth, Texas.

That this great colony, which I shall herein designate as the Western

<sup>1</sup> I here use the sectional name *Virides* for *Crataegus viridis* and the many forms which are closely related to it.

Ozark Colony, has anything to do with the great body of Southern *Virides*, which are, as stated above, coastal plants occurring at low altitudes, is highly improbable, as it nowhere joins this southern body of trees and the individuals composing it show a decided preference for high rocky barrens and plains.

In the first part of this paper I have alluded to the well-known fact of plant association and have named about twenty-five trees and shrubs of the two hundred and odd southern species that occur in southeastern Missouri and which are found with the true *Crataegus viridis* of Linnaeus in the Southern States, and I now call attention to the fact that not one of these characteristically southern plants is to be found associated with the Western Ozark Colony, but that the *Crataegus* is here associated with a very different set of plants, of which *Quercus Marylandica*, *Hicoria villosa*, *Cornus florida*, *Viburnum rufidulum*, *Diospyros Virginiana*, *Fraxinus Americana*, *Sassafras variifolium* and *Ulmus fulva* are the most representative, all plants noted for their preference for high, dry and rocky ground.

Some three years ago I visited Hannibal, Missouri, which is some hundred and twenty-five miles north of Saint Louis, the supposed northern limit of *Crataegus viridis* L., and was agreeably surprised to find on the high hills and mounds there several species or forms of *Virides*, quite a colony, and later I saw many acres of trees in the river bottom opposite Hannibal, in Illinois, near the town named Shepherd.

Having quite recently visited Quincy, Illinois, twenty miles north of Hannibal, Missouri, and one hundred and forty-five miles north of Saint Louis, I was further surprised at seeing the hills and mounds around that place covered with *Virides*, many thousands of individuals, some of the trees being the largest specimens I had ever seen. Many of these trees are on the high hills at Keokuk, Iowa, and the forms no doubt occur in all eastern Iowa, and perhaps as far north as southern Wisconsin. There are so many specimens at this colony, which I shall designate as the Upper Mississippi Colony, perhaps one hundred times as many as in all southeastern Missouri and northeastern Arkansas, that it is undoubtedly the center of greatest abundance, and the *Virides* found at Saint Louis, Missouri, instead of coming up the Mississippi Valley, have really straggled down it.

This Upper Mississippi Colony is so far from the great southern body of *Virides*, having not a single southern plant associated with it, that there can be scarcely any doubt that the species composing it are

distinct from the southern species, and as over three hundred miles of forest land and prairie lie between it and the Western Ozark Colony, an area in which no *Virides* have ever been found, it is hardly probable that the species of the two colonies are the same.

To me it is apparent that in some remote time the Western Ozark Colony, as well as the Upper Mississippi Colony, consisted of a few individuals, which have adapted themselves to their surroundings and have continued to multiply until today there are thousands of individuals at each colony differing more or less from each other and from the original members of the colony.

Whether these forms are sufficiently distinct to be called species or varieties is a question which may never be settled, but I am firmly of the opinion that these colonies contain species more or less fixed, species with which I am somewhat familiar and which are as yet undescribed,<sup>1</sup> but which I do not wish here to describe, leaving that to those more capable of drawing their descriptions and determining their relationships.

Having shown that the center of greatest development for *Crataegus viridis* L. is not, as has been so often stated and generally believed, in the Lower Mississippi or Gulf region, but rather in the Upper Mississippi Valley, and that in all probability this species and its most nearly related congeners were distributed from that center, it may be worth while briefly to inquire, even though it may be possible to do little more than speculate, as to how this distribution was effected.

The true key to the distribution of *Crataegus viridis* L., as of many of our trees and some herbaceous plants, is probably to be sought and ultimately, if ever, found in the records of the flora of the later Tertiary period: a record, unfortunately, very imperfect and but little understood, and one which, at least so far as present day discoveries have gone, seems to have been almost totally effaced in the region under consideration.

It has been pointed out that in Tertiary times a great inland sea or arm of the gulf extended far up the present valley of the Mississippi into what is now southeastern Missouri, occupying all of Missouri lying southeast of a line drawn from Cape Girardeau through White-water, Greenbrier, Wappapello, Poplar Bluff and Acorn, coinciding very nearly with the line of the St. Louis, Memphis and Southeastern

<sup>1</sup> Since this paper was written Sargent has described in the twenty-second Annual Report of the Mo. Bot. Garden, four species of this group.

Railway. Into this inland sea the ancient river was discharged approximately one hundred miles south of Saint Louis, and the colony of southern arborescent species now found in that region is undoubtedly a vestige of the semi-tropical forests that once bordered this ancient sea. Beyond this area, however, deposits of Tertiary age are but little developed in the Upper Mississippi Valley, and scarcely a trace of the fossilized flora has been preserved.

It is a fact perhaps not without significance in this connection, that in southwestern Missouri and southeastern Kansas, where, as has been stated, a form of *Crataegus viridis* is abundant, many of the high hills are covered with a deposit of gravel, consisting of water-worn fragments of chert, undoubtedly of local origin, but indicating the former existence of a great drainage system towards the southwest. These deposits, which are particularly abundant about Webb City and Joplin, Missouri, have been designated by geologists as Lafayette Gravel and assigned to a time late in the Tertiary period. Over the higher elevations of the region they may be traced for many miles, indicating the course and magnitude of an ancient river, as in places they attain a thickness of from ten to eighteen feet. This region lies entirely beyond the area of glaciation, which embraced all of northern Missouri and extended a little south of the Missouri River, and this fact doubtless accounts for the preservation of the Lafayette deposits here, while certainly they would have been obliterated to the northward by the ice mantle and the floods that marked its recession and inundated the country far beyond its southern limits.

The Mississippi River of that period, or its precursor, a small and unimportant stream discharging itself into the Tertiary sea, was doubtless bordered by forests of many species. It is reasonable to suppose that the *viridis* form of *Crataegus* would be borne down by the waters of this stream from its northern home and that individuals would establish themselves at intervals along its course and about the coasts of the ancient sea, following the ever extending limits of the land to the south, until at length a form appeared, the *Crataegus viridis* of Linnaeus, as we know it, which found a suitable habitat and attained a vast development in the low-lying coastal plains of the Gulf States.

On the other hand, following the great drainage system to the southwest, other individuals of the parent species would establish themselves along its course and there enter into competition with

plants of a very different region. As the ancient river system gradually became obliterated owing to the elevation of the land to the south and west, the species composing the lowland forests would one by one become extinct and give place to highland or xerophytic species. Through the vicissitudes of this changing order a form of *Crataegus viridis* was in some manner able to maintain itself, as is testified by its abundance at the present time on the limestone hills of southwest Missouri and the region to the southwestward.

Our present knowledge regarding the origin of species is, of course, not sufficient to enable us to do more than conjecture as to how this came about. Possibly a fortuitous variety or type happened to be developed in this region that was better adapted to the new conditions and was thus able to withstand the increasing dryness, so that, while the species became for the most part extinct in the upper part of the ancient river course, this particular stock was entirely isolated from the parent colony and became the progenitor of the forms of *Crataegus viridis* now found occupying the regions of comparatively high altitude in the southwest, comprising the Western Ozark Colony.

If I have not added any new species to the genus *Crataegus* in this paper, I have at least shown that the *Virides* may have *not* come up the Mississippi Valley, as has generally been supposed, but have probably drifted *down* this Valley from the great Upper Mississippi Colony at Hannibal, Missouri and Quincy, Illinois.

COURTNEY, MISSOURI.

## VIOLA RENIFOLIA AND V. BRAINERDII.

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BOTANISTS who have collected extensively in the Northern States and Canada are familiar with the fact that *Viola renifolia* often appears in two quite different forms: the true *V. renifolia* as described by Gray, with both sides of the leaves "conspicuously beset with pale, soft and tender, lax hairs";<sup>1</sup> and another extreme with the upper leaf-surfaces quite glabrous from the first or in anthesis with

<sup>1</sup> Gray, Proc. Am. Acad., viii. 288 (1870).